HISTORIC PROPERTY INVENTORY FORM

State of Washington, Department of Community Development
Office of Archaeology and Historic Preservation
111 21st Avenue Southwest, Post Office Box 48343
Olympia, Washington 98504-8343 (206)753-4011

IDENTIFICATION SECTION

Field Site No. 405 **OAHP No.** **Date Recorde** 1 July 1997

Site Name Historic Fast Flux Test Facility, Reactor Containment Building

Common Reactor Containment Vessel

Field Recorder Holly K. Chamberlain

Owner's Name U.S. Department of Energy, Richland Operations Office

Address P.O. Box 550

City/State/Zip Code Richland, WA 99352

Status
- [x] Survey/Inventory
- [ ] National Register
- [ ] State Register
- [ ] Determined Eligible
- [ ] Determined Not Eligible
- [ ] Other (HABS, HAER, NHL)
- [ ] Local Designation

Photography Hanford Photography Lab and HCRL

Photography Neg. No. (Roll No. & Frame No.) (See continuation sheet)

View of (See continuation sheet)

Date (See continuation sheet)

Photo at right, HCRL Roll No. 383, Frame No. 13. View to the west.

LOCATION SECTION

Address 405 Building, 400 Area

City/Town/County/Zip Code Richland/Benton County/99352

Twp. 11 N **Range** 27 E **Section** 1 **I/4 Section** SE **1/4 1/4 Sec**

Tax No./Parcel No. **Acreage**

Quadrangle or map name Wooded Island, 7.5 minute series

UTM References Zone 11 **Easting** **Northing**

Plat/Block/Lot

Supplemental Map(s)

Classification [ ] District [ ] Site [ ] Building [x] Structure [ ] Object

District Status [x] NR [ ] SR [ ] LR [ ] INV

Contributing [x] **Non-Contributing** [ ]

District/Thematic Nomination Name Hanford Site Manhattan Project and Cold War Era Historic District

Description Section

Materials & Features/Structural Types

Building Type Industrial

Plan Round

Structural System Carbon Steel

No. of Stories Two

Roof Type
- [ ] Gable
- [ ] Flat
- [ ] Monitor
- [ ] Gambrel
- [ ] Shed
- [ ] Hip
- [ ] Pyramidal
- [x] Other (specify) Rounded Dome

Cladding (Exterior Wall Surfaces)
- [ ] Log
- [ ] Horizontal Wood Siding
  - [ ] Rustic/Drop
  - [ ] Clapboard
- [ ] Wood Shingle
- [ ] Board and Batten
- [ ] Vertical Board
- [ ] Asbestos/Asphalt
- [ ] Brick
- [ ] Stone
- [ ] Stucco
- [ ] Terra Cotta
- [x] Concrete/Concrete Block
- [ ] Vinyl/Aluminum Siding
- [x] Metal (specify) Carbon Steel
- [ ] Other (specify)

Roof Material
- [ ] Wood Shingle
- [ ] Wood Shake
- [ ] Composition
- [ ] Slate
- [ ] Tar/Built-up
- [ ] Tile
- [x] Metal (specify) carbon steel
- [ ] Other (specify)
- [ ] Not visible

Foundation
- [ ] Log
- [ ] Post & Pier
- [ ] Stone
- [ ] Brick
- [ ] Not visible

Concrete
- [ ] Block
- [x] Poured
- [ ] Other (specify)

Integrity (Include detailed description in **Description of Physical Appearance)**

	Intact	Slight	Moderate	Extensive
Changes to plan	x			
Changes to windows	x			
Changes to original cladding	x			
Changes to interior		x		
Other (specify)				

High Styles/Forms (Check one or more of the following)
- [ ] Greek Revival
- [ ] Gothic Revival
- [ ] Italianate
- [ ] Second Empire
- [ ] Romanesque Revival
- [ ] Stick Style
- [ ] Queen Anne
- [ ] Shingle Style
- [ ] Colonial Revival
- [ ] Beaux Arts/Neoclassical
- [ ] Chicago/Commercial Style
- [ ] American Foursquare
- [ ] Mission Revival
- [ ] Spanish Colonial Revival/Mediterranean
- [ ] Tudor Revival
- [ ] Craftsman/Arts & Crafts
- [ ] Bungalow
- [ ] Prairie Style
- [ ] Art Deco/Art Moderne
- [ ] Rustic Style
- [ ] International Style
- [ ] Northwest Style
- [ ] Commercial Vernacular
- [ ] Residential Vernacular (see below)
- [x] Other (specify) Industrial Vernacular

Vernacular House Types
- [ ] Gable Front
- [ ] Gable Front and Wing
- [ ] Side Gable
- [ ] Cross Gable
- [ ] Pyramidal/Hipped
- [ ] Other (specify)

NARRATIVE SECTION

Study Unit Themes (check one or more of the following)

[ ]	Agriculture	[ ]	Conservation	[ ]	Politics/Government/Law
[ ]	Architecture/Landscape Architecture	[ ]	Education	[ ]	Religion
[ ]	Arts	[ ]	Entertainment/Recreation	[ ]	Science & Engineering
[ ]	Commerce	[ ]	Ethnic Heritage (specify) ____	[ ]	Social Movements/Organizations
[ ]	Communications	[ ]	Health/Medicine	[ ]	Transportation
[ ]	Community Planning/Development	[ ]	Manufacturing/Industry	x	Other (specify) Cold War Era
		[ ]	Military	x	**Study Unit Sub-Theme(s)** Reactor Operations, Research and Development, Social History

Statement of Significance

Date of Construction 1978 Architect/Engineer/Builder Battelle Northwest; Westinghouse Hanford Co.

[x] In the opinion of the surveyor, this property appears to meet the criteria of the National Register of Historic Places.

[x] In the opinion of the surveyor, this property is located in a potential historic district (National and/or local).

The Reactor Containment Building housed the reactor and plant operating equipment for the Fast Flux Test Facility, designed to serve as a model for the United States Atomic Energy Commission's Liquid Metal Fast Breeder Reactor Program. Because a breeder reactor was supposed to create more energy than it used, such reactors were expected to stretch the nation's supply of uranium specifically, and other energy resources in general. Breeder reactors had an advantage over light water reactors in that they are able to use almost all the energy available in uranium, as compared to the about 20 percent used by earlier reactors. Liquid metal fast breeder reactors were expected to provide more than half of the United States' supply of electricity by the year 2000. Sodium was used as the coolant because it stayed a liquid at high temperature levels and because of the large number of high energy, or "fast" neutrons it produced during fission. "Fast flux" refers to the speed of neutrons in the core of the reactor during the fission process. The neutrons were not slowed down as they would have been in a conventional reactor. The fast neutrons collided with uranium and thorium atoms, converting them to fissionable atoms, and therefore, more fuel.

(See continuation sheet)

Description of Physical Appearance

The Reactor Containment Building is a cylindrical carbon steel shell which is 186 feet, 8 inches tall and 135 feet in diameter. The steel-lined reinforced concrete cells occupy the lower portion of the building, from grade level to approximately 78 feet below grade. A shielded operating floor is located at grade level. Much of the concrete used was of a high-density type made with iron shot and iron ore, and weighing between 270 and 330 pounds per square foot, as compared to about 150 pounds per square foot for regular concrete. The concrete was hardened to be able to withstand tornado-type winds up to 175 miles per hour. A large fuel handling machine, the closed-loop ex-vessel machine, is located on the operating floor. A structural steel mezzanine above the operating floor perimeter provides additional work area, along with space for heating and ventilation equipment and control panels. A 200-ton polar gantry crane and a jib crane are located above the mezzanine for handling large equipment and materials. The central portion of the operating floor is occupied by a steel operating deck, which is directly above the reactor head compartment.

(See continuation sheet)

Major Bibliographic References

Cabell, C.P. 1980. *A Summary Description of the Fast Flux Test Facility* . HEDL-400. Hanford Engineering Development Laboratory, Richland, Washington.

Davies, Tom, Fast Flux Test Facility Engineer. 31 July 1997. Interview and Tour of Fast Flux Test Facility. Richland, Washington.

Gerber, M.S. 1992. *Legend and Legacy: Fifty Years of Defense Production at the Hanford Site* . WHC-MR-0293. Westinghouse Hanford Company, Richland, Washington.

(See continuation sheet)

Photography, continued
Photography Neg. No.: 54478-2

View of: Reactor Containment Building under construction (foundation).

Date: 12 March 1971

Photography Neg. No.: 58875-44

View of: Containment Building structure complete and capped.

Date: 13 September 1972

Photography Neg. No.: 63126-7CN

View of : Aerial to east of Fast Flux Test Facility complex with Reactor Containment Building in the center. Reactor Control Building, Auxiliary Equipment Building-East, and Auxiliary Equipment Building-West are under construction in the foreground of the Reactor Containment Building.

Date: 6 March 1974

Photography Neg. No.: 91050203-38CN

View of: Reactor Containment Building to east flanked by Dump Heat Exchangers to the right.

Date: May 1991

HCRL Roll 383, Frame 11

View of: Reactor Containment Building from south

Date: 31 July 1997

Photography, continued
HCRL Roll 383, Frame 13

View of: Fast Flux Test Facility complex to west.

Date: 31 July 1997

Statement of Significance, continued

The Fast Flux Test Facility, with its four test loops, was intended to be the key test reactor in the nation's breeder reactor program. While the reactor core housed the "driver" fuel which actually powered the reactor, the loops could accommodate experimental fuels and other tests.

Construction and Costs

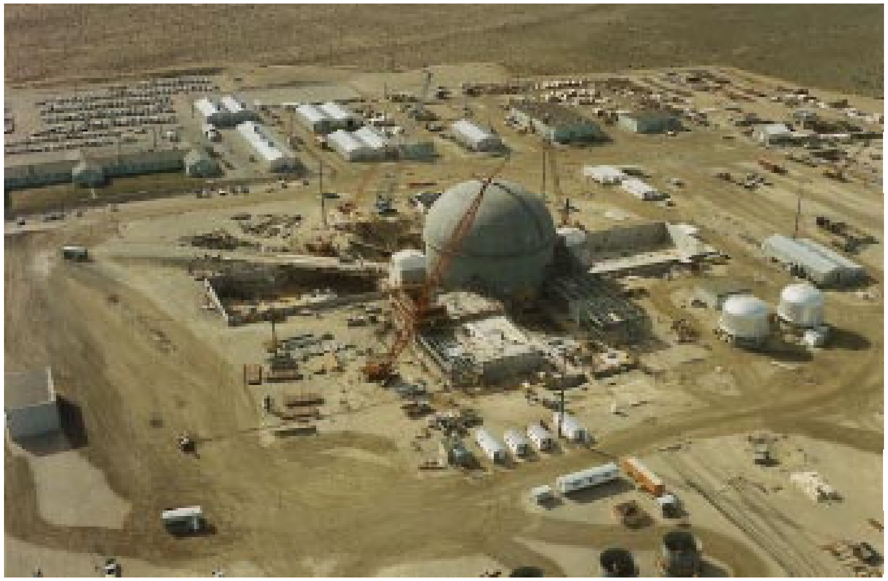
Work on a breeder reactor for the United States dates back to the early days of the Manhattan Project, when the theory was conceptualized. Active research began in 1945 but varied in intensity over the years based on the amount of funding involved and national priorities. Several experimental models were developed, such as the mercury-cooled Clementine fast neutron flux reactor, which operated from 1946 to 1953 at the Los Alamos, New Mexico laboratory and demonstrated the use of a fast neutron flux, plutonium fuel, and liquid metal for a coolant. The first reactor to prove the feasibility of breeding was Argonne National Laboratory's Experimental Breeder Reactor No. 1, started in 1951, which also provided more in-depth information on the technology and engineering involved with using liquid metal coolants until its closure in 1963.

Establishing the Liquid Metal Fast Breeder Reactor Program in the mid-1960s as a national priority grew

Reactor Containment Building under construction (foundation), 1971 (#54478-2)

Statement of Significance, continued

Containment Building structure complete and capped, 1972 (#58875-44)



Fast Flux Test Facility complex with Reactor Containment Building in the center, 1974 (#63126-7cn)

Statement of Significance, continued

out of the recognition by the United States Atomic Energy Commission of the growing worldwide scarcity of uranium supplies at a point when increasing numbers of nuclear reactors were being built for electric power production. Many other countries, including France, Great Britain, the then Soviet Union, Germany, Italy, and Japan, made similar decisions to pursue development of the breeder technology at about the same time.

Development of the prototype American liquid metal fast breeder reactor, the Fast Flux Test Facility, was begun in earnest by the Atomic Energy Commission in 1966. The goal was to develop and demonstrate, in cooperation with industry, the technology needed to economically operate large, commercial breeder reactor power plants. The Fast Flux Test Facility was to be used for trying out fuels and materials for presumed long-range use in the breeder reactor program. Battelle Memorial Institute's Pacific Northwest Laboratory in Richland was given responsibility by the Atomic Energy Commission that same year to oversee conceptual design of the test facility, provide data on the economics of breeder reactors, and test fuels. As envisioned at the time, the facility was expected to cost $87.5 million dollars, begin operating in 1972 or 1973, and have a 20-year lifetime. The Hanford site was selected in January 1967 as the location for its construction because there was sufficient land available, a trained work force, Battelle was already working on the project in concert with other Hanford site contractors, and one of Washington's senators, Henry M. Jackson, brought his considerable influence to bear on the decision. Bringing the Fast Flux Test Facility to Hanford was considered a success for the site's economic diversification efforts begun in 1963 by Dr. Fred Albaugh, associate director of Battelle, and Paul Holsted, senior site representative of the Atomic Energy Commission's division of reactor development and technology.

In June, 1969, Battelle was appointed by the Atomic Energy Commission to add operation of the Fast Flux Test Facility to its existing design management responsibilities. Battelle's role as project manager come to an end less than a year later in February 1970 when Westinghouse Electric Corporation received the contract. Westinghouse created the Hanford Engineering Development Laboratory to serve the reactor program. Preliminary designs started to become reality later that year when ground was broken in December at the 400 Area construction site. In the meantime, one revision of planned completion time and two of what would be many project cost estimate increases had been posited – the

Statement of Significance, continued

Fast Flux Test Facility was now predicted to be completed in 1974 and cost $130 million dollars. Federal commitment to the test facility project, and its intended successor projects, remained high into the 1970s. Plans then called for the construction of two large-scale demonstration breeder reactor plants, one by 1980. The Nixon administration endorsed a continuation of the long-range breeder reactor program in 1971, and contractors prepared to compete for the contract to build the first full-scale, but still a demonstration. plant. Local boosters hoped that Hanford would be the site selected. In November of the next year, that proved not to be the case as a site on the Clinch River in Tennessee was chosen.

Meanwhile, construction at the Fast Flux Test Facility proceeded. Westinghouse officials declared the containment vessel 10 per cent complete in October 1972, and had begun ground excavation for the support buildings. By early 1973, total project costs were expected to rise as high as $187.8 million – increases which were justified by Westinghouse on the basis that the original estimate of costs was based on a conceptual design – not the actual project, and that some increases were due to inflation. The federal funds kept arriving, however, as did parts of the reactor facility. In March, the 21,000 gallon stainless steel sodium coolant tank arrived from Portland via an unusual truck with one driver at the front and one in the back. Special permission was obtained from state highway officials to allow the behemoth to go the wrong way on a cloverleaf highway interchange near Kennewick in order to make the necessary turns. The 122-ton reactor guard vessel arrived by barge a month later, and another stainless steel storage tank – this one weighing 80,000 pounds – came by barge in November. (Other items came by barge also, as many project components were too heavy or wide for highways.) Construction activity that year kept 1500 craftspeople on the job, covering two shifts a day of installing concrete reinforcing rod and welding together 10-ton segments of carbon steel plate for the containment vessel. Other workers were busy inspecting the resulting two-plus miles of weld – every inch was radiographed for flaws.

Cost and completion time estimates continued to increase as construction proceeded. In March, 1974, the year that the Fast Flux Test Facility was originally expected to be finished, the containment vessel was complete but the rest of the complex only 25 per cent done. Total projected costs had risen to $420 million, with completion expected in 1977. Westinghouse officials justified some cost overruns as being inevitable because

Statement of Significance, continued

design was continuing as construction was underway, thereby creating technical difficulties. This was a typical problem with Hanford construction projects, many of which were one-of-a-kind, or the first of their kind, or took place over a number of years. A related problem was the need for and high cost of a large quantity of "engineered hardware," the items that were designed specifically for use in the Fast Flux Test Facility. Paying for prototypical parts for a prototypical facility drove up costs dramatically. These costs were justified on the basis that the items being manufactured for the test facility would later cost less when used in the expected large number of breeder reactors to be constructed. Also, the high costs were bearing far-flung economic benefits in that project suppliers came from 21 states.

The expense was staggering, however. Just the 210 feet of 28-inch stainless steel pipes used for sodium coolant cost $7,000 per foot alone – by the time they were fabricated and polished in the eastern United States, transported to Pasco, Washington to be beveled, shaped, and welded, and brought to the 400 Area in Richland for installation and testing. In January 1975, cost overruns amounting to 386 per cent caught the attention of Congress, which ordered an investigation by the United States General Accounting Office. The estimated eventual total cost overrun was projected to be 6-9 billion dollars – or, the largest nonmilitary cost overrun in the nation's history. Only one military project, the B-1 bomber, had surpassed that total.

At least one member of Congress advocated scrapping the project all together. However, the project had sufficient proponents who kept voting for funding, even as projected costs continued to rise – to $622 million by March, 1975. Westinghouse created a series of project speed-up objectives to address Congressional criticisms, and provided a series of reasons why the project should continue. Westinghouse and Federal Energy and Resource Development Administration nuclear power policy officials noted that "construction" costs were a thing of the past, as that aspect of the project was essentially complete and only "installation" and "testing" costs remained. They had also weathered a three-month strike in the fall of 1974 which drove up costs but labor prices were now expected to remain steady for the duration. Labor cost projections from 1973 had been based on only a 5.5 per cent salary increase because that was the maximum amount allowed at the time by the presidential freeze on

Statement of Significance, continued

wages. Twelve million dollars of the increase was attributed to design changes – the number of which would be expected to decrease because design was essentially complete. Various high-level staffing changes at Westinghouse in summer, 1975 and in the Fast Flux Test Facility project office of the Energy Research and Development Administration in early 1976, and a reconfiguring of the production schedule also led to expectations that the project would get on track. A project advocate noted that building the test facility was like building five reactors because the main reactor and four test loops all had separate sets of controls.

Project speed-up objectives from 1975 were achieved, but projected costs continued to increase, to $646 million in 1976, and expected time of completion got farther away. A six-month strike in 1976 put the project behind four months. In 1977, the test facility was judged to be 77 percent complete but overall completion was not expected until August of 1978, and criticality not until August of 1979. Cost overruns persisted even as federal energy policy and associated funding were shifting away from research and development of nuclear power projects toward an emphasis on energy conservation, use of coal, and a build-up of the strategic oil reserve. The Carter administration cut $200 million dollars from the Liquid Metal Fast Breeder Reactor Program in 1977, heralding the reduced future of the program. Indeed, the Fast Flux Test Facility's successor Clinch River breeder reactor project was cancelled, leaving the test facility as something of an orphan.

<u>Operations</u>

Construction was, however, completed in September of 1978, nine years after it started – and at a cost of $647 million dollars. System tests were conducted in 1978 and 1979, and the reactor went critical in February of 1980. Two years later it reached full power, and achieved the distinction of having its first operating cycle last 53 days—the longest ever at the time for a sodium-cooled reactor. Other achievements and significant mileposts included fuel performance and records and tests, control rod experiments which greatly extended their lifetimes, a performance award from the American Nuclear Society, a very good record for safe operations, and tests of space nuclear power technology development. The National Society of Professional Engineers rated the Fast Flux Test Facility as one of the top ten engineering achievements of 1982.

Statement of Significance, continued

A number of applications for test facility capabilities were tested and/or discovered. For example, In 1986, the first production of the rare isotope gadolinium-153 in the test facility was completed, and in the highest purity ever. Sales of this isotope, used in the early detection of osteoporosis, began in September 1987; supplies from the Fast Flux Test Facility were used to avoid a worldwide shortage in 1988. Other important medical isotopes were produced as well. International cooperation was an important success of the Fast Flux Test Facility. Several international research programs were carried out. For example, researchers from the United States and Japan cooperated in March, 1988 on the design and implementation of the first multi-national experiment geared solely to fusion energy research.

Reactor Containment Building to east flanked by Dump Heat Exchangers to the right;1991 (#91050203-38cn)

Operation of the Fast Flux Test Facility was not without controversy. Questions about its safety arose over allegations of fuel pin defects raised by Karen Silkwood, union activist and employee of the Kerr-McGee Corporation in Crescent City, Oklahoma, which manufactured the fuel at a plant there. In the early 1970s, Silkwood charged that Kerr-McGee was negligently making defective fuel pins and shipping them to the Hanford site. In 1974, she became contaminated with plutonium and died that same year in a car accident while on her way to meet a reporter for *The New York Times*. Her supporters claimed that she was murdered; no convictions were ever made. Her allegations remained unproven. Operation of the test facility proceeded with no fuel pin ruptures. In 1983, the

Statement of Significance, continued

Tri-City Herald reported that Kerr-McGee had supplied 19,570 fuel pins for the test facility between 1972 and 1976. Of those, 789 were judged unsuitable for fuel during standard inspection procedures at the Hanford site, although some were kept for experiments (a standard practice). Fuel pins were also purchased in that same time period from a Babcock and Wilcox plant in Pennsylvania. The rejection rate was the same for both companies.

In 1990, plans for closure by the United States Department of Energy prompted Westinghouse officials and other advocates to present Congressional testimony in favor of keeping the test facility open. Reasons cited included the potential for the facility to aid in the clean up of the Hanford site by burning radioactive waste, to produce radioisotopes for medical needs, and to continue with international research projects. Department of Energy officials claimed, however, that $100 million dollars could be saved a year by closing the test facility, and that its functions could be taken over by other operations. In 1992, the Department of Energy placed the Fast Flux Test Facility in standby mode due to its lack of defined mission. In 1993, the Department of Energy ordered a phased shutdown process, which is still in process today.

The Reactor Containment Building of the Fast Flux Test Facility is significant under Criterion A, due to its association with the peaceful use of atomic power in the Cold War era. Therefore, it is the conclusion of the U.S. Department of Energy that the Reactor Containment Building is eligible for inclusion in the National Register of Historic Places as a contributing property within the Hanford Site Manhattan Project and Cold War Era Historic District.

Description of Physical Appearance, continued

The reactor was located in the center of the Reactor Containment Building in a shielded cell. It was capable of producing 400 megawatts of thermal power. Sodium was used to cool the reactor because, in its liquid state, it has good heat transfer properties as compared to water. Therefore, it allows for faster neutron movement than either light or heavy water reactors. Sodium was used in a molten state because the molecules in sodium vapor are too far apart to conduct heat as well. After the heat was removed from the reactor, the sodium coolant transported it through various pumps, pipes, and heat exchangers to finally transfer it to the outside air through dump heat exchangers.

<u>Fuel Pins</u>

The driver fuel for the Fast Flux Test Facility was of an unprecedented type – pellets of depleted uranium oxide mixed with plutonium oxide. The one-quarter-inch long pellets each contained energy equal to 566 pounds of coal, and were expected to be recycled enough times to equal 6,000 pounds of coal. The pellets were inserted into approximately 8-foot tall stainless steel fuel “pins,” which were bundled together within a 12-foot long hexagonal stainless steel duct tube to form a fuel assembly. Each pin had a space on top for a unique “tag,” or, identification, gas capsule filled with various mixtures of xenon and krypton. That way, if problems arose with a fuel assembly while in the reactor, the tag gas could be analyzed to determine which fuel pin was at fault, and it could be pulled from the fuel assembly. The stainless steel fuel pin caps not only kept the pellets within the cladding, but also provided structural support for placement within the duct. Each pin was wrapped its entire length with a wire which kept it from touching another within the duct. Proper spacing was important so that critical mass was not reached. Criticality studies on the fuel pins were done at the Hanford site’s Critical Mass Laboratory in the 200 East Area.

Description of Physical Appearance, continued

Potential problems with the fuel assemblies included warping and metal creep. The former was dealt with by turning the fuel within the reactor to a different direction so that the fuel pins would gradually warp back into proper position. Metal creep is a term referring to the tendency of the stainless steel pellet and fuel assembly housings to gradually expand over time because the high level of neutrons within the reactor caused the steel atoms to migrate, thereby creating minute holes. This was controlled by using cold-worked steel, which tended to creep less than hot-worked steel, and by leaving a very small space for metal growth within the pin. The cladding was also subject to various problems over time which tended to erode it. This situation was dealt with by calculating in a “wastage allowance” -- making the cladding infinitesimally thicker than needed.

Fuel assembly components were brought from the manufacturer to the 308 Building in the Hanford site’s 300 Area for assembling and testing. The fuel components were stored there, until time for assembly, then bundled together into hexagonal shape, slid into a duct, and welded shut. Tests included checking the quality of the pellets and fuel pin welds. Non-fuel test assemblies, such as those for irradiating metals or other materials for experimental purposes, were fabricated in the 306-E Building. From the 308 Building (or 306-E Building, depending on the type of assembly), the fuel or test assembly was taken to the 400 Area, where it was prepared for insertion into the reactor. Test assemblies were taken to the Test Assembly Conditioning Station at the Reactor Containment Building, and placed into a test loop within the reactor.

The fuel assemblies were taken to the Core Component Conditioning Station where they were heated to a temperature of 400 degrees Fahrenheit. The assemblies had to be pre-heated prior to insertion in the reactor to prevent warping. The fuel or test assembly was then loaded into the reactor at one of three locations by means of the closed-loop ex-vessel machine (CLEM), which had its own argon source and heating and cooling systems. The closed-loop ex-vessel machine was used to pick up assemblies within containment and insert them into the proper reactor module.

Description of Physical Appearance, continued

Refueling

A typical fuel assembly lasted for 1 to 1 1/2 years, although some lasted for several years. To refuel the test facility, one of the three in-vessel handling machines was operated remotely to remove the fuel assembly. The in-vessel handling machine would select the assembly to be removed based on a computer program telling it which "detents" – cut-out notches on the top of the assembly which were unique to each assembly – to select. (Each assembly also had a unique serial number.) The arm of the machine would then lift out the old assembly and place it into the in-vessel storage module. It would then pick up a "green," or unirradiated fuel assembly, for insertion into the proper location. The "spent," or, already irradiated assemblies, remained in the in-vessel storage module for approximately one operating cycle (100 days) so that they could physically and radioactively cool off enough to go in the closed-loop ex-vessel machine.

After cooling for the proper time, the closed-loop ex-vessel machine moved the assembly into the interim decay storage vessel, which was also within containment, and could hold approximately 199 driver fuel or test assemblies. The interim decay storage vessel was taken out of containment to a spent fuel storage facility, where a variety of washing cycles were employed, prior to loading the fuel assemblies into a heavily-shielded stainless steel core component container (cask) for eventual transfer to an interim storage area.

Major Bibliographic References

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Hollingsworth, R.E. 1972. *Environmental Statement, Fast Flux Test Facility, Richland, Washington*. WASH-1510. United States Atomic Energy Commission, Richland, Washington.

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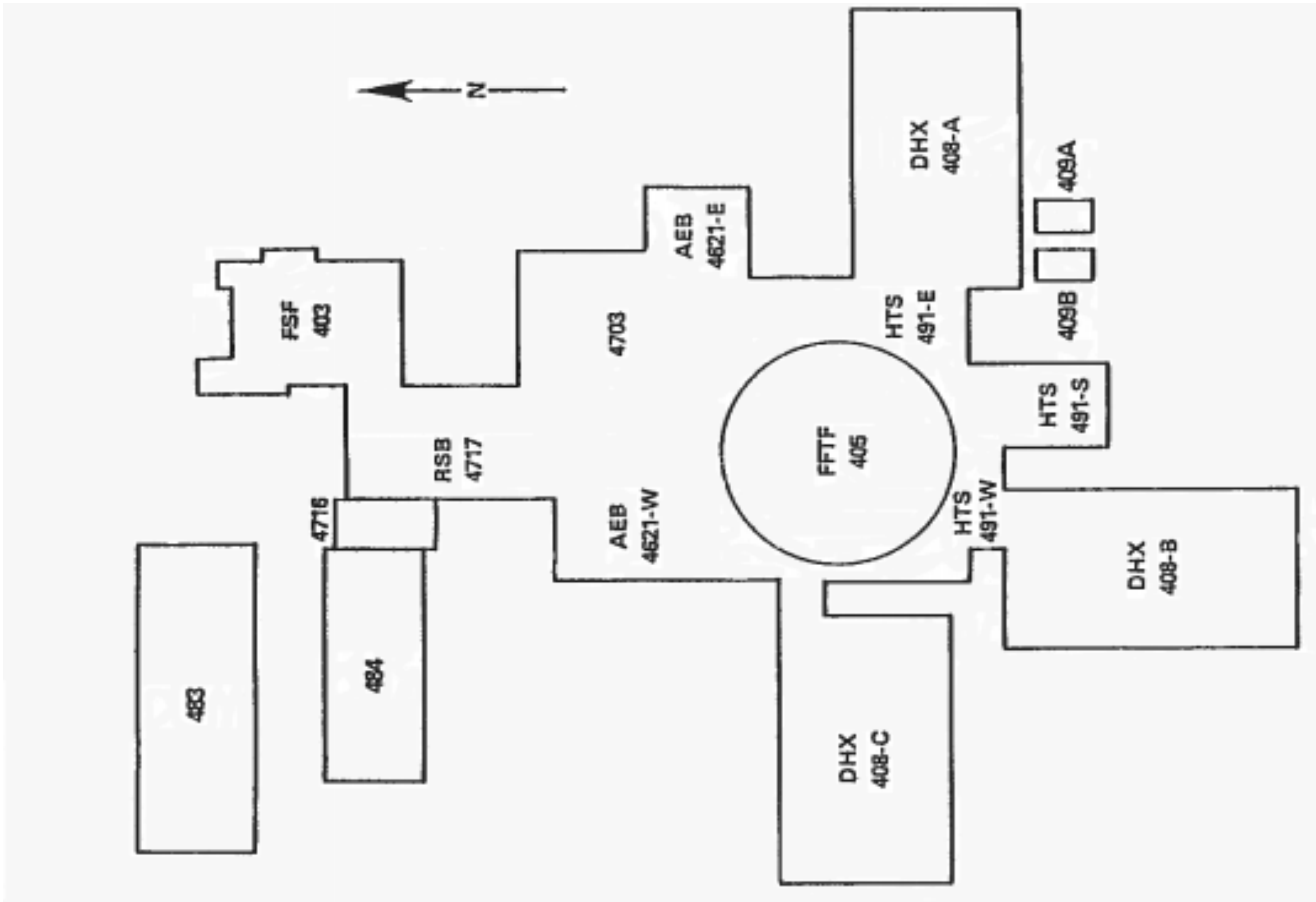
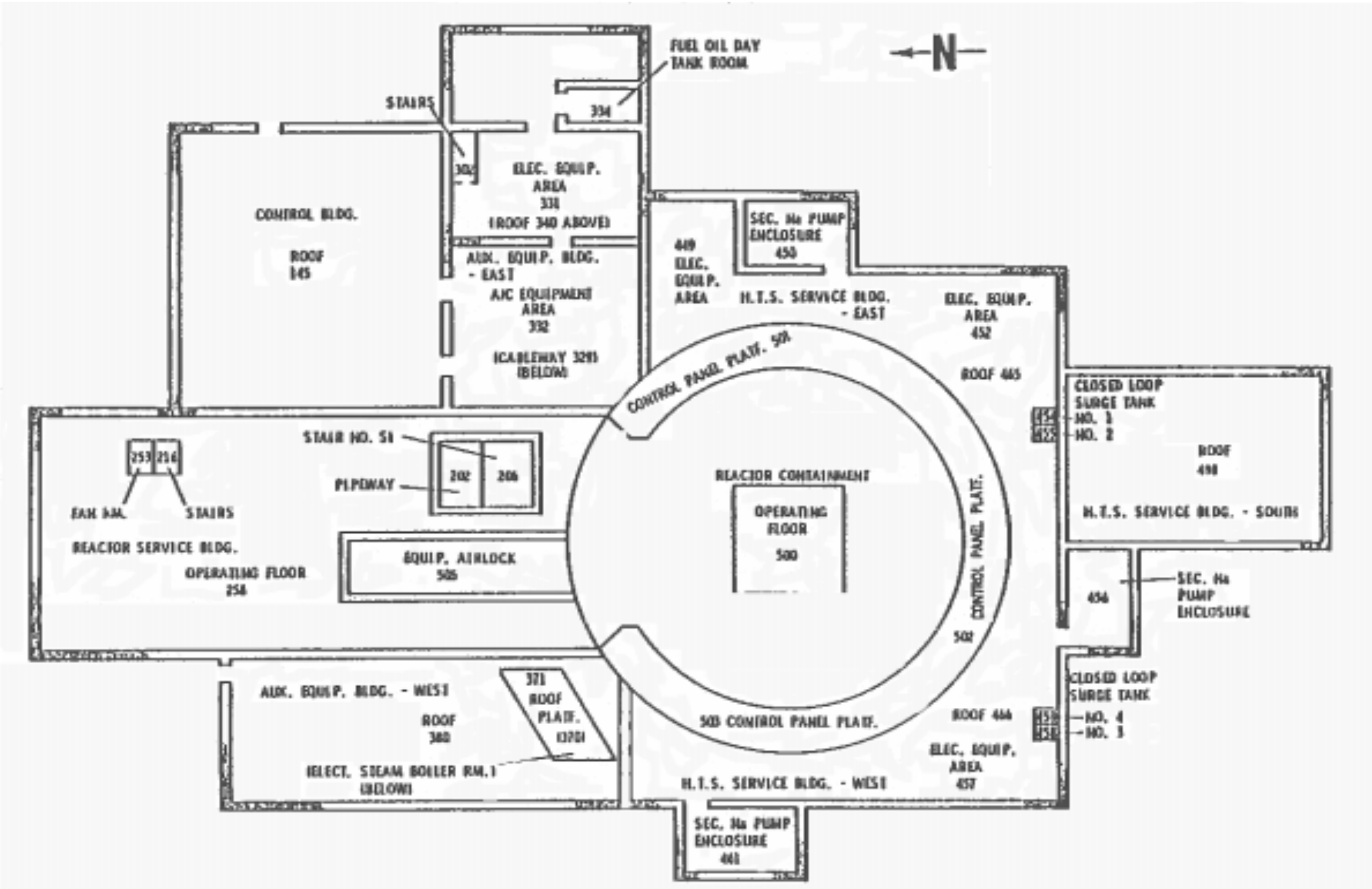
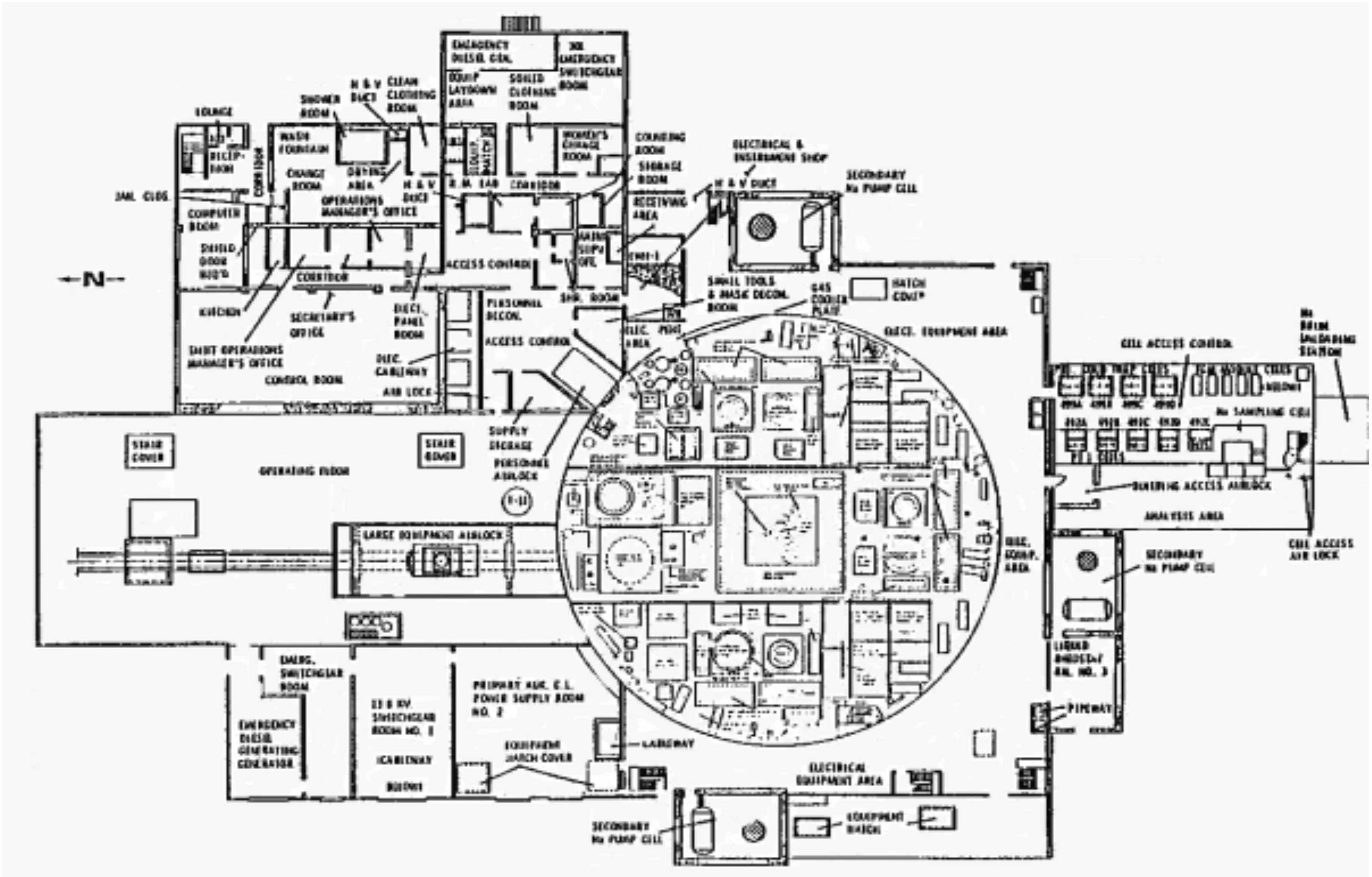
Shaw, Milton. 1972. "The role of FFTF in the U.S. LMFBR programme." *Nuclear Engineering International*.
Tri-City Herald, various issues, 1967 – 1997.



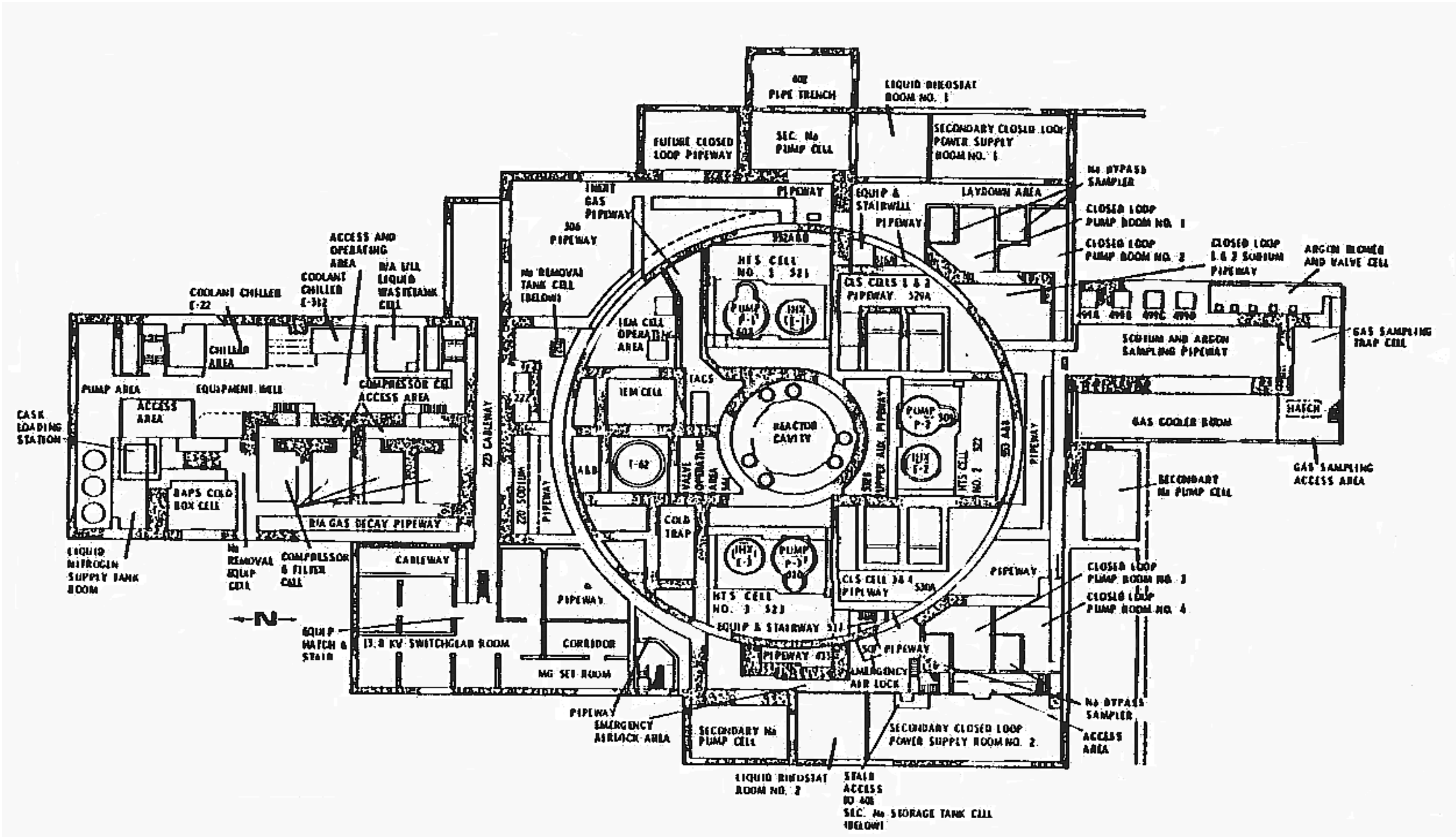
Fast Flux Test Facility Building Layout



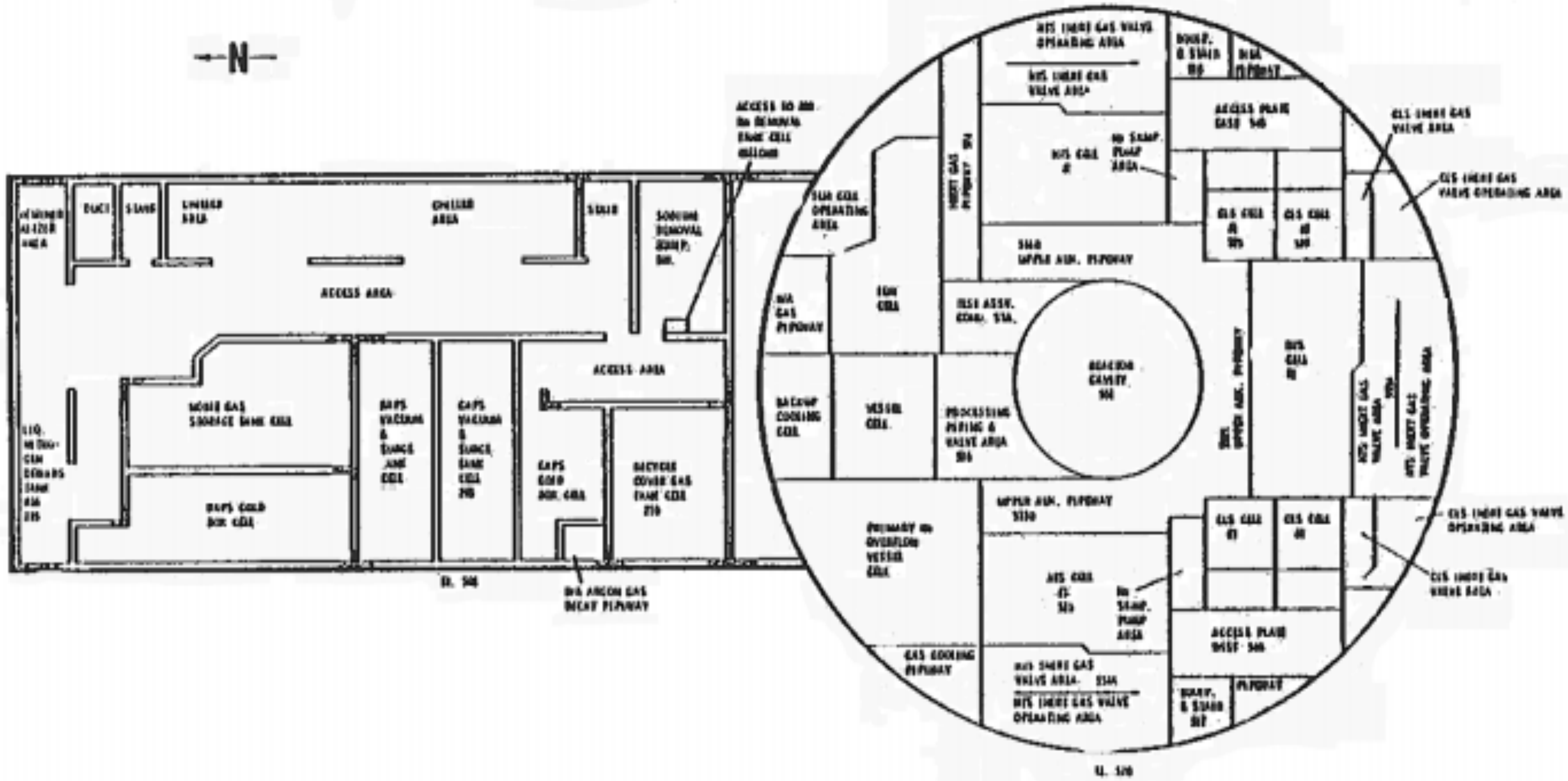
Reactor and Support Buildings, 580-ft Level



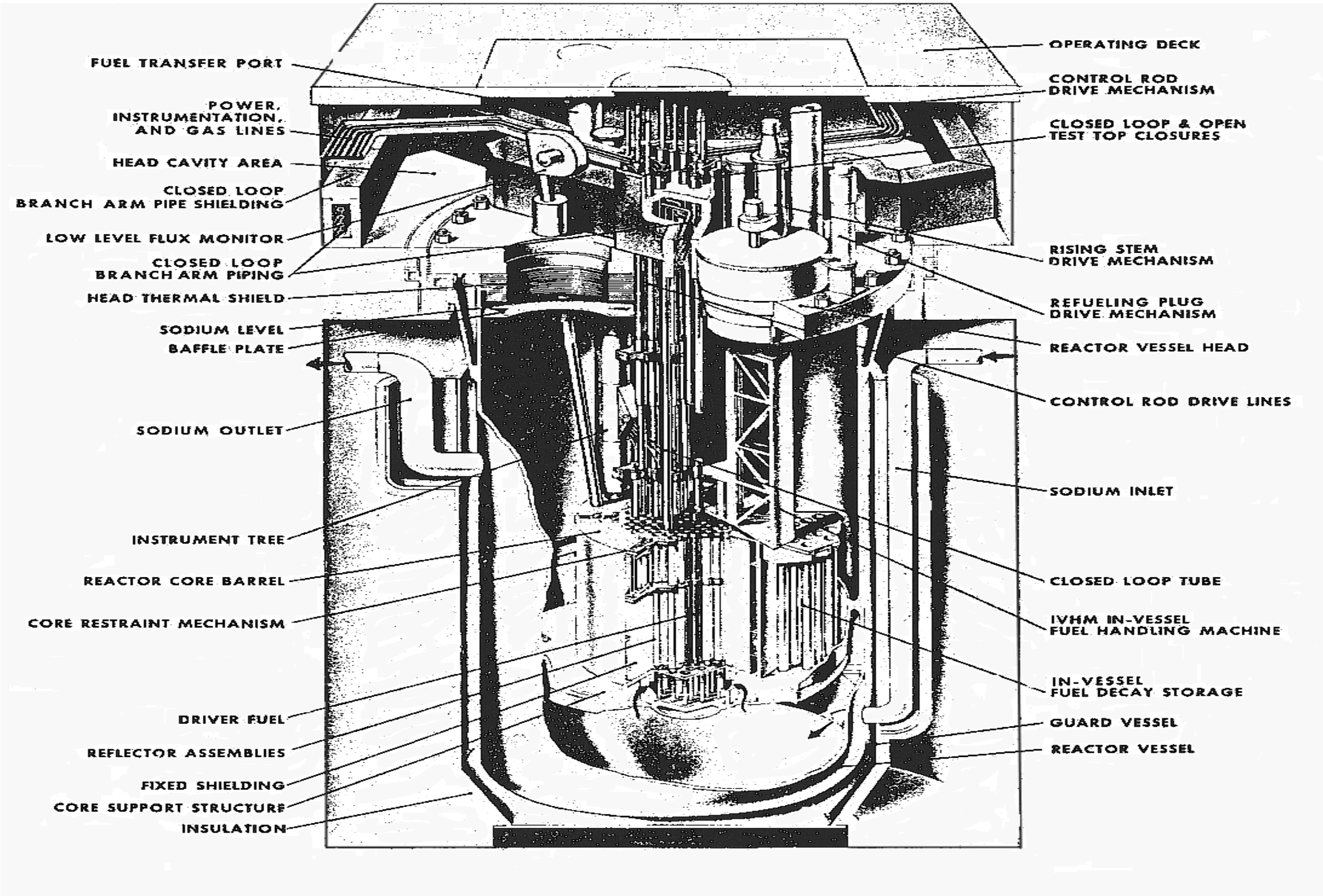
Reactor and Support Buildings, 550-ft Level



Reactor and Support Buildings, 533-ft Level



Reactor and Support Buildings, 520-ft Level



Reactor Assembly